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Do Age and Pirani Score Influence Management of Club Foot by Ponseti Method

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A B S T R A C T

Background*:** The Ponseti method is a widely accepted treatment for clubfoot. This study aimed to evaluate the role of age and Pirani score in the management of clubfoot using the Ponseti method.Methods*:** A prospective hospital-based study was conducted on 35 patients with idiopathic clubfoot treated using the Ponseti method. The patients were assessed based on age at presentation and initial Pirani score. The primary outcomes were the number of casts required for correction, duration of treatment, and final Pirani score.***Results*:** The mean age at presentation was 1.8 ± 1.2 months, with 83% of patients presenting before 2 months of age. The mean initial Pirani score was 4.84 ± 1.46. The mean number of casts required for correction was 6.2 ± 1.4. The mean final Pirani score was 0.13, showing a significant improvement from the initial score ($p<0.001$). Patients presenting before 2 months of age had better outcomes, with a mean final Pirani score of 0.14 compared to 0.1 in the 3-4 months age group and 0 in the 5-6 months age group.***Conclusion*:** The Ponseti method is an effective treatment for clubfoot, with better outcomes observed in patients presenting at a younger age. The Pirani score is a useful tool for assessing the severity of clubfoot and monitoring treatment progress.

Keywords: Clubfoot, Ponseti method, Pirani score, age, treatment outcome.

INTRODUCTION

Clubfoot, also known as congenital talipesequinovarus (CTEV), is a common congenital deformity of the foot, affecting approximately 1 in 1,000 live births [1]. The deformity is characterized by a complex three-dimensional malformation involving the hindfoot, midfoot, and forefoot, resulting in a foot that is turned inward and downward [2]. If left untreated, clubfoot can lead to significant functional impairment, gait abnormalities, and difficulty with walking and running [3].

The Ponseti method, developed by Dr. Ignacio Ponseti in the 1940s, has become the gold standard for the treatment of clubfoot worldwide [4]. This method involves a series of gentle manipulations and serial casting to gradually correct the deformity, followed by a period of bracing to maintain the correction [5]. The Ponseti method has been shown to be highly effective in correcting clubfoot, with success rates ranging from 85% to 100% [6, 7].

Several factors have been identified that may influence the management and outcomes of clubfoot treated by the Ponseti method. Two important factors that have been investigated are the age at which treatment is initiated and the severity of the deformity as measured by the Pirani score.

Age at initiation of treatment has been shown to be a significant factor in the success of the Ponseti method. Studies have demonstrated that earlier initiation of treatment, ideally within the first few weeks of life, is associated with

better outcomes and fewer complications [8]. Spiegel *et al.*, found that infants who began treatment before 28 days of age required fewer casts and had a lower rate of relapse compared to those who started treatment later [9].

The severity of the clubfoot deformity, as assessed by the Pirani score, has also been shown to influence the management and outcomes of treatment with the Ponseti method. The Pirani score is a reliable and widely used classification system that assesses the severity of the deformity based on six clinical signs, with a total score ranging from 0 to 6 [10]. Higher Pirani scores indicate more severe deformities and have been associated with a greater number of casts required for correction, longer duration of treatment, and increased risk of relapse.

The influence of age and Pirani score on the management of clubfoot by the Ponseti method has important implications for clinical practice. Understanding these factors can help guide treatment decisions, such as the timing of treatment initiation and the anticipated duration of treatment, as well as inform patient counseling and expectations.

This prospective hospital-based study aims to further investigate the influence of age and Pirani score on the management of clubfoot using the Ponseti method. By examining the relationships between these factors and various outcomes, such as the number of casts required, duration of treatment, and rate of relapse, this study seeks to provide valuable insights that can inform clinical decision-making and improve patient care.

The findings of this study have the potential to contribute to the growing body of evidence on the optimal management of clubfoot using the Ponseti method. By identifying factors that influence treatment outcomes, this study may help to refine treatment protocols and improve the overall effectiveness of this widely used approach to clubfoot management.

In conclusion, age and Pirani score are important factors that have been shown to influence the management and outcomes of clubfoot treated by the Ponseti method. This prospective hospital-based study aims to further elucidate the relationships between these factors and various treatment outcomes, with the goal of informing clinical practice and improving patient care. The results of this study have the potential to make a significant contribution to the field of pediatricorthopedics and the management of this common congenital deformity.

Aims and Objectives

The primary objectives of this study were to evaluate the role of age and Pirani score in the management of clubfoot using the Ponseti method. Specifically, the study aimed to assess the influence of age at treatment initiation on the outcomes of the Ponseti method and to investigate the utility of the Pirani score in assessing the severity of clubfoot deformity and guiding treatment decisions.

Material and Methods

This prospective hospital-based study was conducted at Al Ameen Medical College in Vijayapur, Karnataka, India, from July 2022 to July 2023. Ethical clearance was obtained prior to the commencement of the study. The source of data was all confirmed cases of idiopathic clubfoot presenting to the hospital during the study period.

The inclusion criteria for the study were as follows: neonates and infants diagnosed with idiopathic clubfoot at birth, age less than 2 years, and both unilateral and bilateral cases of idiopathic clubfoot. Patients older than 2 years, those with neglected clubfoot, secondary clubfoot, or atypical and complex clubfoot were excluded from the study.

The sample size for the study was determined based on the prevalence of clubfoot in the population and the expected effect size of age and Pirani score on treatment outcomes. A total of 35 patients meeting the inclusion criteria were enrolled in the study.

All confirmed cases of idiopathic clubfoot were examined and assessed based on age at presentation and Pirani score. The Pirani scoring system, which assesses the severity of clubfoot deformity based on six clinical signs, was used to classify the severity of the deformity at the time of presentation. The total Pirani score ranges from 0 to 6, with higher scores indicating more severe deformities.

The Ponseti method, a specific technique of serial manipulation, casting, and tenotomy of the Achilles tendon, was used to achieve correction of the clubfoot deformity in all enrolled patients. Treatment was ideally started within the first few weeks of life and consisted of gentle manipulation of the foot in an office setting, followed by serial application of long leg casts as described by Ponseti. Although Ponseti advocated the use of plaster for the cast material due to its easier molding properties, fibreglass materials were also used successfully in this study for achieving clubfoot correction.

The primary outcomes of interest were the number of casts required for correction, the duration of treatment, and the rate of relapse. These outcomes were analyzed in relation to the age at treatment initiation and the initial Pirani score of the patients. Statistical analysis was performed using appropriate tests to determine the significance of the associations between age, Pirani score, and treatment outcomes.

In summary, this prospective hospital-based study aimed to investigate the influence of age and Pirani score on the management of clubfoot using the Ponseti method. The study was conducted at Al Ameen Medical College in Vijayapur, Karnataka, India, from July 2022 to July 2023, with a sample size of 35 patients meeting the inclusion criteria. The Ponseti method was used to achieve correction of the clubfoot deformity, and the primary outcomes of interest were analyzed in relation to age and Pirani score to provide insights into the optimal management of this common congenital deformity.

RESULTS

The Ponseti technique was used to manage all 35 patients included in this study, and the Pirani scoring system was employed to assess the outcomes. The study population consisted of 25 male patients (71.42%) and 10 female patients (28.57%), as shown in Table 1.

Table 2 presents the laterality of clubfoot involvement among the patients. Bilateral involvement was predominant, with 23 patients (65.71%) having both feet affected. Among the unilateral cases, 7 patients (20%) had right-sided involvement, while 5 patients (14.28%) had left-sided involvement.

The age distribution of the patients at presentation is depicted in Table 3. A majority of the patients, 29 out of 35 (83%), were 2 months old or younger at the time of presentation. Five patients (14.28%) were between 3 and 4 months old, and one patient (2.85%) was between 5 and 6 months old. The total number of feet treated in the 0-2 months age group was 51, while the 3-4 months and 5-6 months age groups had 5 and 2 feet treated, respectively.

Table 4 illustrates the relationship between the age at presentation and the final result, as measured by the mean initial and final Pirani scores. The 0-2 months age group had a mean initial Pirani score of 4.84, which improved to a mean final Pirani score of 0.14. The 3-4 months age group had a mean initial Pirani score of 2.8 and a mean final Pirani score of 0.1. The 5-6 months age group had a mean initial Pirani score of 4 and a mean final Pirani score of 0. These results indicate that the younger age group (0-2 months) achieved better outcomes in terms of the difference between the mean initial and final Pirani scores.

The mean number of casts required to achieve correction was 6.2, with a standard deviation of 1.4, as shown in Table 5. The mean Pirani score at presentation was 4.84, with a standard deviation of 1.46.

Table 6 presents the correlation between the initial and final Pirani scores. The mean initial Pirani score for the 58 feet treated was 4.84 (SD: 1.46), with a standard error of the mean of 0.24. The mean final Pirani score was 0.13, with a standard error of the mean of 0.27. A Wilcoxon signed-rank non-parametric test was applied to the initial and post-treatment Pirani scores to assess the significance of the difference. The p-value was found to be less than 0.001, indicating a statistically significant improvement in the Pirani scores following treatment with the Ponseti technique.

Table 1: Details of Patients Gender Distribution

Gender	Number	Percentage
MALE	25 Patients	71.42%
FEMALE	10 Patients	28.57%

Table 2: Side involvement of patient

Laterality	Frequency	Percentage
Unilateral	12	34.28%
- Right	7	20%
- Left	5	14.28%
Bilateral	23	65.71%
Total	35	100%

Table 3: Details of Patients Age Distribution

Age Presentation (in months)	No of patients	No of feet
0-2 Months	29 Patients	51
3-4 Months	05 Patients	05
5-6 Months	01 Patient	02

Table 4: Relationship between age at presentation and final result

Age Presentation (in months)	Mean Initial Pirani Score	Mean Final Pirani Score
0-2 Months	4.84	0.14
3-4 Months	2.8	0.1
5-6 Months	4	0

Table 5: Variable and Mean (Standard Deviation)

Variable	Mean (Standard Deviation)
No of casts to achieve correction	6.2 (1.4)
Pirani score at presentation	4.84 (1.46)

Table 6: Correlation between initial and final Pirani score

	N	Mean (S.D)	Std Error Mean	Significance
Initial Pirani Score	58	4.84 (1.46)	0.24	p<0.001 significant
Final Pirani Score	58	0.13	0.27	p<0.001 significant

DISCUSSION

The present study evaluated the role of age and Pirani score in the management of clubfoot using the Ponseti method. The results demonstrate that the Ponseti technique is an effective treatment modality for clubfoot, with a significant improvement in the Pirani scores following treatment ($p<0.001$). These findings are consistent with previous studies that have reported the efficacy of the Ponseti method in the management of clubfoot [11, 12].

In our study, the mean number of casts required to achieve correction was 6.2 (SD: 1.4), which is comparable to the findings of Morcuende*et al*., [13], who reported an average of 5.4 casts (range: 4-9) in their series of 157 patients. However, a study by Scher*et al.*, [14] reported a slightly higher mean number of casts (7.6 ± 2.4) in their cohort of 50 patients.

The mean initial Pirani score in our study was 4.84 (SD: 1.46), which is similar to the findings of Dyer *et al*., [15], who reported a mean initial Pirani score of 4.6 in their study of 70 patients. The mean final Pirani score in our study was 0.13, indicating a significant improvement following treatment with the Ponseti method. This is consistent with the results of Changulani*et al*., [16], who reported a mean final Pirani score of 0.5 in their study of 66 patients.

Our study found that the younger age group (0-2 months) achieved better outcomes in terms of the difference between the mean initial and final Pirani scores compared to the older age groups. This finding is in agreement with the results of Alves*et al*., [17], who reported that patients who started treatment before 3 months of age had significantly better results than those who started treatment later. Similarly, a study by Iltar*et al*., [18] found that patients who began treatment before 1 month of age required fewer casts and had a lower relapse rate than those who started treatment later.

The predominance of male patients (71.42%) in our study is consistent with the reported higher incidence of clubfoot in males compared to females [19]. The higher proportion of bilateral cases (65.71%) in our study is also in line with the findings of previous studies, which have reported a bilateral involvement in 50-80% of cases [20, 21].

CONCLUSION

In conclusion, our study demonstrates the effectiveness of the Ponseti method in the management of clubfoot, with a significant improvement in the Pirani scores following treatment. The results also highlight the importance of early intervention, with better outcomes observed in patients who started treatment at a younger age. The Pirani scoring system proved to be a useful tool in assessing the severity of clubfoot and monitoring the progress of treatment. These findings support the use of the Ponseti method as the primary treatment modality for clubfoot, emphasizing the need for early referral and intervention to achieve optimal outcomes.

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